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INDIA WEATHER REVIEW, 1954

ANNUAL SUMMARY

PART C

STORMS AND DEPRESSIONS

CONTENTS

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ANNUAL SUMMARY

PART C

STORMS AND DEPRESSIONS

1. DEPRESSIONS AND CYCLONIC STORMS

During the year, two cyclonic storms and seven depressions formed in the Bay of Bengal and three depressions in the Arabian Sea. The dates of activity of the storms and the greatest barometric depths, observed or estimated near their centres are given in the following table.

TABLE I

Locality	Month	Date	Greatest Observed or estimated. barometric depth
Bay of Bengal	September–October––	24th September 1st October	14 mbs. (Estimated)
Bay of Bengal	December	16th-18th	10 mbs. (Estimated)

The detailed descriptions of these storms and depressions are followed by an account of western disturbances and the more important local storms and of localities in which winds of force 9 or more unconnected with cyclonic storms were experienced by ships in the Indian Seas.

1. Depression in the Arabian Sea—23rd to 25th April, 1954.—A trough of low pressure developed in the east Arabian Sea off the Kanara south Konkan coast on the 21st April. It persisted there for the next two days and became accentuated on the 23rd by merging with a low pressure area which appeared over the Comorin-Maldive area on the 22nd. In association with it, there was an influx of maritime air into the south Peninsula, where widespread thunderstorm rain was reported on the 23rd morning. During the course of the day, the upper air cyclonic circulation associated with the trough intensified and extended up to 20,000 ft. a.s. l. and by the evening of the 23rd, conditions became markedly unsettled off the Kanara-south Konkan coast. On the morning of 24th, a depression formed with its centre at 0830 hrs. IST near Lat. 12·0°N and Long. 73·5°E. At that hour S.S. Boigvain (Lat. 14·0°N and Log. 74·0°E) reported northeasterly wind of force 5 B.F. and Mangalore southeasterly wind 5 knots and a thunderstorm. Moving in a northerly direction, the depression was centred at 1730 hrs. IST near Lat. 14·0°N and Long. 73·0°E, as will be evident from the following observations recorded by S.S. Mozaffari at 1200 hrs. GMT.

"... passed through centre of a depression situated in Lat. 14°18′N and Long. 73°20′E; change of wind was well marked from northeast to southwest force 6-7; rough sea and heavy swell, sky overcast with heavy rain; type of cloud cumulonimbus, visibility about 3 miles and further reduced in showers, some thunder and lightning...."

By the morning of 25th, the depression weakened into a shallow trough of low pressure which lay off the Kanara coast. The trough gradually weakened and became unimportant by the 28th.

In association with the depression, fairly widespread thundershowers occurred in Malabar and South Kanara, Travancore-Cochin, west Mysore and south Tamilnad from the 23rd to 25th. A few significant amounts of rainfall are: 23rd—Palghat 4″ and Pamban 3″; 24th—Hassan 3″.

A feature of the depression was its limited extent. It was observed as a well developed circulation only over a small area and was embedded in the extended trough of low pressure in the east Arabian Sea.

2. Deep depression in the Arabian Sea—8th to 10th June, 1954.—In association with the advance of the monsoon into Malabar and South Kanara on the 1st June, a shallow trough of low pressure formed in the east Arabian Sea off the Kanara-south Konkan coast on the same day. The trough shifted very slowly northwards during the course of the next six days and became well marked off the north Konkan coast on the 8th morning. At that time, pressure deficiency at Bombay was about 8 mbs. and the upper air cyclonic circulation associated with the trough extended up to 15,000 ft. a.s.l. S.S. Tarantia (Lat. 17·7°N and Long. 69·0°E) reported a northwesterly wind of 15 knots and moderate continuous rain at 1130 hrs. IST, while Bombay reported a southeasterly wind of 25 knots at 0830 hrs IST.

By the 1730 hrs. IST of the 8th the trough concentrated into a depression centred near Lat. 19·0°N and Long. 70·5°E, the S. S. Strathaird (Lat. 18·8°N and Long. 70·7°E) reporting a southsouthwesterly wind of 30 knots. The depression moved in a northwesterly direction and was centred at 0830 hrs. IST of 9th near Lat. 20·0°N and Long. 70·0°E. At that hour, Veraval reported an easterly wind of 15 knots and a pressure of 995 mbs. which was 9 mbs. below normal. The depression moved northwestwards and was centred near Lat. 20·5°N and Long. 69·5°E at 1730 hrs. IST of the same day when Veraval winds veered and became southeasterly 14 knots. Without any appreciable movement, the depression became deep by 0530 hrs. IST of the 10th when the strength of Veraval wind increased to 25 knots with a pressure of 992 mbs. which was about 10 mbs. below normal. By 0830 hrs. IST, the winds at Veraval strengthened to 36 knots and had veered from southeast to southwest during the preceding three hours suggesting that the deep depression was centred close to coast at that hour between Veraval and Porbandar.

At 1050 hrs. IST, Warship Sind reported the following:

".... passed close to storm centre in position Lat. 20°50'N, Long. 68°46'E at 0520 GMT. Barometric pressure 996 mbs., winds gusting to 60 kts for 3 minutes varying".

Since the 60 kt gusts were reported to have lasted only for 3 minutes and the wind was reported to be varying it is very probable that the ship might have been caught in a region of squally weather and unsteady winds rather than in the centre of the disturbance. The fact that the barometric pressure was as high as 996 mbs. also lends support to the above possibility.

Moving northwards, the deep depression rapidly weakened into a shallow one centred at 1730 hrs. IST between Bhuj and Jamnagar. Weakening further into a low pressure area, it became unimportant on the next day.

In association with the depression, the monsoon extended into Saurashtra and Kutch and Gujarat on the 11th as a feeble current, the associated rainfall, however, being only local. Idar recorded 5·7″ on the 9th.

3. Depression in the Bay of Bengal—4th to 6th July, 1954.—A trough of low pressure was approaching coastal Andhradesa on the evening of 30th June and it persisted in west central Bay for two days. Thereafter, it moved into northwest Bay on the morning of 3rd July when pressures were falling along the coast around the head Bay of Bengal. The eastern end of the seasonal monsoon trough had extended into the northwest and adjoining west central Bay. Simultaneously, the monsoon strengthened in the Bay to the south of Lat. 16·0° N and widespread rain was reported from the Bay Islands. On the morning of 4th, weather became unsettled in the northwest Bay with the associated upper air cyclonic circulation extending up to 10,000 ft. a.s.l. By the 5th morning, the unsettled conditions concentrated into a depression with its centre at 0830 hrs. IST near Lat. 19·5°N and Long. 88·0°E. The following observations of 5th are relevant in this connection.

Name of ship or station	Position		Hour of obsn. (IST)	Wind		Remarks
	Lat. °N	Long. °E		Direction	Speed (Kts)	
S. S. Sofala	20·2	88·9	0530	SE	15	Rain in last hour.
Sandheads	..	..	0830	E	15	..
Saugor Island	..	..	0830	E	18	..
Puri	..	..	0830	N	15	Moderate continuous rain.

With the advance of the day, pressures fell further along Orissa coast where widespread rain continued. The depression moved rapidly westnorthwest and was centred at 1730 hrs. IST of 5th near Lat. 20·0°N and Long. 86·5°E; the pressure departure at the centre was estimated to be about −9 mbs. Thereafter, the depression showed signs of weakening as it continued to move westnorthwest. It passed inland between Chandbali and Puri in the early hours of the 6th and at 0830 hrs. IST lay as a 'low' over Orissa. Puri and Sandheads each recorded 5″ of rain during the 24 hours ending at 0830 hrs. IST of 16th. The 'low' continued to move westnorthwest, causing fairly widespread rain in Orissa and Madhya Pradesh and by the morning of 7th merged into the seasonal trough. The following table gives the district averages and noteworthy amounts of rainfall associated with the depression.

State and district	District average on			Particularly heavy falls
	4th	5th	6th	
Madhya Pradesh				
Durg	..	..	2·98	On 6th—Selod 5·8″.
Raipur	..	1·66	2·51	On 6th—Mahasamund 5.9″ Lakholi 5·0″.
Bastar	..	..	1·44	
Chanda	..	..	1·80	
Balaghat	..	1·13	1·80	
Hoshangabad	..	1·10	1·40	On 5th—Sohagpur 5·0″.
Chhindwara	..	1·20	1·30	
Amravati	..	..	1·10	

4. Depression in the Arabian Sea—7th to 10th July, 1954.—Simultaneously with the depression off the Orissa coast (mentioned above), a feeble trough of low pressure appeared over south Saurashtra and Gulf of Cambay on the morning of 5th July. Widespread and locally heavy rain occurred in Saurashtra, Veraval and Dwarka reporting 5″ and 4″ respectively on the 5th morning. During the course of the day, pressures continued to fall over south Saurashtra and the Gulf of Cambay. By the morning of 6th, the trough became well marked and shifted slowly northwards intensifying at the same time. On the morning of 7th, a depression formed over Saurashtra with its centre at 0830 hrs. IST

about 50 miles to the southwest of Bhavnagar. The pressure deficiencies at Veraval and Bhavnagar were both about 9 mbs. and at the centre of the depression it was estimated to be about 10 mbs. Moving in a northwesterly direction, the depression was centred at 1730 hrs. IST of the same day between Rajkot and Jamnagar. By the morning of the 8th, it emerged into the northeast Arabian Sea and was centred at 0830 hrs. IST about 80 miles to the northwest of Dwarka. At that hour, Dwarka was reporting southsouthwesterly winds of 5 knots, and a pressure deficiency of about 9 mbs. Moving northwest and weakening somewhat, it lay on the morning of 9th about 100 miles to the south of Karachi. Weakening further and moving northwards it lay as a shallow low pressure area over Sind on the morning of 10th and merged into the seasonal low on the next day.

In association with this depression, fairly widespread rain occurred in and near Saurashtra and Kutch from the 5th to the 10th with locally heavy to very heavy falls on some days. The following table gives the district averages and noteworthy amounts of rainfall associated with the depression.

State and district	District average on						Particularly heavy falls
	7th	8th	9th	10th	11th	12th	
Konkan							
Thana	2·3	1·5	1·0	1·0	1·3	2·9	
Bombay	5·7	1·5	2·0	..	..	2·7	
Kolaba	3·5	2·1	2·3	1·4	2·0	3·6	On 7th—Panvel 7·6″, Uran 5·5″, Matheran 5·6″.
Ratnagiri	4·1	1·7	1·4	1·9	3·7	2·8	On 7th—Ratnagiri 6·5″, Rajapur 5.9″, Devrukh 7·3″, Chiplun 5·6″, Lanja 7·7″.
North Kanara	2·7	1·9	1·2	..	2·4	1·3	On 7th—Sirsi 6·1″, Siddapur 8·2″. On 8th—Siddapur 5·7″.
Gujarat							
Banaskantha	..	..	..	1·7	3·3	1·5	
Mehsana	..	..	..	..	1·8	2·7	
Sabarkantha	..	..	..	..	..	2·2	
Ahmedabad	..	..	..	..	1·4	1·2	
Kaira	..	..	..	..	1·7	1·4	On 11th—Mohmadabad 7·8″.
Panchmahals	..	..	..	..	..	1·3	
Surat	..	..	..	1·7	1·1	2·5	On 12th—Mandvi 5·3″.
Saurashtra	..	..	..	..	..	1·0	On 7th-Veraval 5·4″. On 8th-Veraval 5·3″. On 10th-Chuda 5·1″.

5. Shallow depression in the Bay of Bengal—30th July to 2nd August 1954.—On the evening of 29th July, the seasonal monsoon trough was noticed to extend into the west central and adjoining northwest Bay. An upper air cyclonic circulation extending up to 10,000 ft. a.s.l. developed off the Circars coast and the monsoon strengthened to the south of Lat. 17·0°N. Pressure began to fall along and near the south Orissa and north Circars coasts and rise in coastal West Bengal and the south Circars coasts. By the next morning, a shallow depression formed in the northwest Bay with its centre at 0830 hrs. IST near Lat. 18·5°N and Long. 86·5°E as will be seen from the following observations.

Name of the ship or station	Position		Hour of obsn. IST	Wind		Remarks
	Lat. °N	Long. °E		Direction	Speed (knots)	
S. S. Havildar	18·4	86·9	0530	S	16	
S. S. Mahadevi	19·0	87·3	0530	SE	12	
Gopalpur	..	..	0830	N	5	
Calingapatam	..	..	0830	NW	5	
S. S. Magdapur	16·1	83·2	0530	W	18	Showery.

The depression remained practically stationary till the evening of 30th without any sign of intensification. It then moved slowly in a northerly direction. By 0530 hrs. IST of the 31st, it had weakened into a shallow "low" with central region near Lat. 20·0°N and Long. 86·5°E. Rainfall along Orissa-Circars coast decreased and the upper air cyclonic circulation in the northwest Bay and neighbourhood weakened. The shallow 'low' weakened further, but a residual low pressure area persisted for the next two days over west central and adjoining northwest Bay of Bengal.

6. Shallow depression in the Bay of Bengal—5th to 9th August, 1954.—The residual low pressure area associated with the previous depression which persisted over the west central Bay and neighbourhood was accentuated by a fresh easterly wave which moved westwards across central Burma on the 4th. The monsoon strengthened over the Bay of Bengal to the south of Lat. 15·0°N causing widespread and locally heavy rain over the Bay Islands and south Burma coast. Port Blair reported 6″ of rain on the 6th morning. On the morning of 7th, the trough concentrated into a shallow depression with centre at 0830 hrs. IST near Lat. 18·5°N and Long. 86·5°E as will be seen from the following observations of that day.

Name of the ship or station	Position		Hour of obsn. IST	Wind		Remarks
	Lat. °N	Long. °E		Direction	Speed (knots)	
S. S. Mahadevi	18·6	87·0	0530	SSW	15	
S. S. Bharatjal	18·4	85·2	0530	NW	10	Raining.
Puri	..	..	0530	NE	5	
Sandheads	..	..	0830	SSE	10	

The pressure deficiency at the centre of the depression was estimated to be about 8 mbs. With the formation of the depression, widespread and locally heavy rain was reported from south Orissa and north Circars coast on the 7th, Calingapatam and Koraput recording

3″ each. Moving in a northerly direction, the depression was centred at 0830 hrs. IST of 8th near Lat. 20·0°N and long. 87·0°E. At 0530 hrs. IST of this day, S.S. Indian Commerce (Lat. 19:8°N and Long. 87·8°E) reported southsouthwesterly 20 knots and Sandheads southsoutheasterly 10 knots. Continuing the northward movement, the shallow depression was close to coast near Balasore at 0830 hrs. IST of 9th. During the course of the day, it passed inland and weakening into a low pressure area lay over Gangetic West Bengal, Chota Nagpur and adjoining Bihar in the evening. Subsequently it merged into the seasonal trough.

In association with the depression, there was a general strengthening of the monsoon over the country between the 7th and the 11th.

7. Deep depression in the Bay of Bengal—1st to 5th September, 1954.—On the 1st September, the eastern end of the monsoon trough became well marked and extended into the west central and the adjoining northwest Bay. The monsoon was generally strong in the southeast and east central Bay. A general fall of pressure was observed along the West Bengal-Orissa-Circars coasts, while there was a general rise of pressure along the Coromandel and Burma coasts. By the next morning, the trough was reinforced by a low pressure wave which moved from the east and a depression formed with its centre at 0530 hrs. IST near Lat. 18·0° N and Long. 88·0°E as would be seen from the following observations of the 2nd.

Name of the ship or station	Position		Hour of obsn. IST	Wind		Remarks
	Lat. °N	Long. °E		Direction	Speed (knots)	
S. S. Bharatjal	17·7	84·9	0530	NW	9	
S. S. Jalaganga	16·4	89·4	0530	SSW	5	
Sandheads	..	..	0530	SE	13	
Cuttack	..	..	0530	NNE	5	
Gopalpur	..	..	0530	NW	2	Slight continuous drizzle.

At 0830 hrs. IST of 2nd, pressures were falling further along West Bengal-Orissa coasts while they were rising along Circars-Coromandel coasts. Moving slowly in a northwesterly direction, the depression was centred near Lat. 18·5°N and Long. 87·5°E at 1730 hrs. IST when S.S. Bharatjal (Lat. 18·8°N and Long. 86·8°E) reported northeasterly winds 5 knots and showery weather. By the morning of 3rd, the depression became deep and was centred at 0830 hrs. IST near Lat. 19·5°N and Long. 86·5°E. At that hour, Puri reported northeast 15 knots wind and continuous drizzle and S.S. Bharatjal (Lat. 19·8°N, Long. 87·3°E) reported southerly 13 knots and thunderstorm rain. The pressure deficiency at Puri at 0830 hrs. IST was about 12 mbs. Widespread and locally heavy rain occurred in Orissa and Gangetic West Bengal on that morning. With the advance of the day, the deep depression showed signs of weakening and by 1730 hrs. IST it was crossing the Orissa coast between Gopalpur and Puri. Moving in a westnorthwesterly direction, it lay over east Madhya Pradesh on the morning of 4th with its centre near Gondia. The pressure deficiency at its centre at this time was about 8 mbs. Pursuing still a westnorthwesterly course, the depression lay over west Madhya Pradesh with its centre between Hoshangabad and Khandwa on the morning of the 5th. By the next morning, it weakened into a low pressure area which lay over north Gujarat and filled up on the 7th.

In association with the movement of the depression, there was a spell of widespread and locally heavy to very heavy rain over a belt extending from Orissa and east Madhya Pradesh to Gujarat and the Konkan. There was torrential rain at some places in Gujarat on the 6th, Broach recording an exceptionally heavy fall of 19″. Other noteworthy amounts of rainfall are—4th —Jagdalpur 6″, Chanda 5″; 5th—Dahanu 9″, 6th—Surat 14″.

The following statement gives the district averages and noteworthy amounts of rainfall associated with the depression. Rainfall figures for State raingauge stations in Orissa are not available.

State and district	District average on					Particularly heavy falls
	1st	2nd	3rd	4th	5th	
Madhya Pradesh						
Durg	..	..	..	3·2	..	On 4th—Khapari 6·1″ Bhatagaon 6·0″, Rajnandgaon 6·6″, Dongargarh 6·3″. On 5th—Selod 5·9″.
Raipur	..	..	1·0	1·4	..	On 3rd—Gariabund 5·3″.
Bastar	..	..	1·3	2·7	..	On 4th—Jagdalpur 6·4″, Antagarh 5·6″.
Chanda	..	..	..	3·2	2·3	On 4th—Chanda 5·3″ Kunghari 6·3″, Garmusi 5·4″, Sindhevahi 5·4″. On 5th—Khairee 5·1″ Garmusi 6·4″, Sin,-dhewahi 6·0″.
Bhandara	1·2	..	..	1·8	1·2	On 3rd—Deori 5·7″.
Hoshangabad	..	..	..	1·0	..	
Nimar	..	..	..	2·0	2·7	
Chhindwara	..	..	..	1·0	..	
Wardha	..	..	..	3·3	1·3	
Nagpur	..	..	..	2·0	1·2	
Akola	..	..	..	1·2	1·9	
Amravati	..	..	..	1·6	1·2	
Buldhana	..	..	..	..	2·1	
Yeotmal	..	..	..	2·4	2·9	On 4th—Wani 5·3″, Pandekawra 9·0″.
Chota Nagpur						
Hazaribagh	..	..	..	..	..	On 5th—Dhanwar 6·3″.
Singhbhum	..	..	1·0	..	..	

State and District	District averages on 1st	2nd	3rd	4th	5th	6th	Particularly heavy falls
West Bengal							
Madhya Bharat							
Rutlam	..	4·1	..	..	1·2	..	
Dewas	1·2	..	..	..	1·2	..	
Indore	2·3	..	..	1·4	2·2	..	On 1st—Indore 5·0″. On 5th—Manpur 5·7″.
Nimar	..	1·0	1·2	3·2	2·6	..	On 4th—Khargone 6·5″, On 5th—Rajpur 5·8″, Bhikangaon 5·7″.
Dhar	..	1·3	..	1·7	1·3	..	
Jhabua	1·9	..	1·0	..	1·9	..	
Sehore	1·0	..	..	..	..	..	
Gujarat							
Mehsana	..	..	..	..	1·1	2·1	
Sabarkantha	..	..	..	..	1·3	1·9	
Ahmedabad	..	..	..	..	..	2·7	
Kaira	..	2·0	..	..	..	4·4	On 6th–Mohmadabad 5·2″, Nadiad 6·3″, Thasra 5·5″, Borsad 5·5″, Savli Tank 6·1″.
Panchmahals	1·5	..	1.0	..	1·4	3·5	On 6th–Kalol 6·4″.
Baroda	2·0	1·1	1.3	..	1·3	2·9	
Broach	1·3	1·3	1·0	1·3	2·0	4·0	On 3rd–Rajpipla 5·3″. On 4th—Bhalod 7·5″; On 6th—Broach 19·1″, Ankleshwar 8·7″ Rajpipla 9.6″.
Surat	2·2	2·8	2·5	4·3	5·6	4·7	On 1st–Bansada 5·2″. On 4th Balod 6·5″, Chikhli 10·1″, Bulsar 8·7″, Dharampur 9·1″, Bansada 5·7″, Mahua 6·1″; On 5th—Mandvi 5·9″, Valod P 10·3″, Chikhli 7·6″, Bulsar 7·3″, Pardi D 7·2″, Dharampur 6·7″, Bansada 7.3″, Mahua 6·5″; On 6th—Surat 14.2″, Bardoli 5·4″, Bansada 5·4″, Navsari 7.3″.
North Konkan							
Thana	3·7	3·5	4·3	3·4	4·9	3·3	On 1st—Mokhada P 5.9″, Vada 6·1″, Mahim 6·3″; On 2nd–Mahim 6·9″ Dahanu 5·9″; On 3rd–Bassein 6·9″, Mahim 6·5″, Barivali 6·7″; On 4th-Mahim 7·3″; On 5th-Kalyan 5·4″, Vada 7.3″, Mahim 9·1″, Dahanu 9·4″; On 6th—Mahim 9·8″.
Bombay	2·5	4·2	3·3	1·2	2·7	2·4	
Kolaba	3·9	3·8	2·9	3·0	2·9	3·4	On 1st–Matheran D 5·7″; On 2nd Panvel 6·2″, Matheran D 7·6″; On 3rd Matheran 5·1″., On 6th Matheran D 6·9″.

8. Depression in the Bay of Bengal—19th to 25th September, 1954.—On the morning of 19th, a low pressure wave from the east moved into the north Andaman Sea and the adjoining east central Bay. Widespread and locally heavy rain was reported from the Bay Islands and the Tennasserim coast, Port Blair and Long Island recording 5″ and 3″ respectively. Pressures fell over the Deltaic Burma and the Arakans during the course of the day and by evening, a pressure deficiency of 4 to 5 mbs. was observed over that region. On the morning of 20th, the low pressure wave moved northwestwards and conditions became markedly unsettled over the east central and the adjoining northeast Bay, with the associated cyclonic circulation extending up to 15,000 ft. a.s.l. Widespread and locally heavy rain was again reported from the Bay Islands and the east coast of Burma on the 20th, Table Island recording 7″ and Long Island, Port Blair, Tavoy and Victoria Point 3″ each. During the course of the day, the low pressure area associated with the unsettled conditions moved further northwest and pressures began to fall briskly along the coasts of north Circars, West Bengal and East Pakistan and rise over the south Arakan and Deltaic Burma. The pressure deficiency at 1730 hrs. IST was about 6 mbs. along the coasts of East Pakistan and West Bengal. By the 21st morning, the low pressure area concentrated into a depression with its centre at 0830 hrs. IST near Lat. 20·0°N and Long. 88·0°E. The pressure deficiency at the centre of the depression was estimated to be of the order of 7 mbs. The following observations of 21st are relevant in this connection.

Name of the ship or station	Position Lat. °N	Long. °E	Hour of obsn. IST	Wind Direction	Speed (knots)	Remarks
Saugor Island	..	..	0830	NNE	11	
Sandheads	..	..	0830	E	2	
Chandbali	..	..	0830	NW	2	
Akyab	..	..	0830	SSE	5	Intermittent slight drizzle.
S. S. Bharatjal	19·7	86·4	0530	W	5	Rain showers.
S. S. Jalamohan	17·8	91·5	0530	S	12	Rain in sight.

During the course of the day, the depression moved westnorthwest and at 1730 hrs. IST, it was close to coast near Chandbali. Moving westnorthwest, the depresion weakened into an extended trough of low pressure on the 22nd morning and lay over south Orissa

and adjoining northeast Madhya Pradesh. Thereafter, it continued to move westnorthwest and fed by a fresh supply of equatorial maritime air from the Arabian Sea, it concentrated again into a depression on the morning of 23rd over west Madhya Pradesh, with its centre at 0830 hrs. IST near Hoshangabad. The pressure deficiency at the centre of the depression was observed to be about 11 mbs. During the course of the next 24 hours, the depression moved northwest and lay on the morning of 24th over southeast Rajasthan with its centre between Ajmer and Kotah. The pressure deficiency at the centre of the depression at this time was observed to be about 8 mbs. only, indicating that it was weakening. Under the influence of an active westerly wave which was moving across the extreme north of the country, the depression then took a northerly course and lay on 25th morning with its centre at 0830 hrs. IST between Hissar and Ganganagar. Thereafter, it weakened and moving northeastwards broke up over the hills of the Punjab(I) by the next day.

Under the influence of the depression, fairly widespread rain was reported from coastal West Bengal, Orissa and east Madhya Pradesh on the 21st. In association with its movement across the country, widespread and locally heavy rain with a few very heavy falls occurred successively in Madhya Pradesh, north Gujarat, east Rajasthan and the Punjab(I) during the next 4 days. The following table gives the district averages and the significant amounts of rainfall.

State and district	District Averages on								Particularly heavy falls
	19th	20th	21st	22nd	23rd	24th	25th	26th	
Madhya Bharat									
Bhilsa	..	1.5	..	..	..	..	..	..	
Shajapur	..	..	..	..	1·8	..	..	..	
Ujjain	1·3	..	..	1·4	2·0	1·9	..	..	On 23rd—Ujjain 6·1″.
Ratlam	..	..	..	1.6	4·5	1·0	..	..	On 23rd—Jaora 5·9″, Sailana 5·2″.
Mandsaur	..	..	..	..	1·0	..	..	..	
Dewas	..	..	..	2·5	3·2	1·8	..	..	On 24th—Kannod 5·3″.
Indore	1·3	..	..	..	3·1	2·9	1·0	..	
Nimar	..	..	..	1·2	1·0	..	..	..	
Dhar	..	..	..	1·0	3·2	..	..	..	
Jhabua	2·6	..	..	..	..	3·8	..	..	
Raesen	..	..	..	..	1·3	..	..	..	
Sehore	..	..	..	..	2·8	..	..	..	On 23rd—Nasrullaganj 5·2″.
Madhya Pradesh East									
Durg	..	..	..	2·7	2·0	..	..	..	On 22nd—Khapari 7·2″, Bhatagaon 7·3″. On 23rd—Selod 8·5″.
Raipur	..	..	..	2·6	..	..	..	..	On 22nd—Dhamtari 5·5″, Kurud 6·8″, Kondapur 5·0″.
Bilaspur	..	..	..	1·5	..	..	..	..	
Raigarh	..	..	..	1·1	..	1·5	..		
Chanda	..	..	..	1·3	..	..	..	..	
Bhandara	..	..	..	..	2·0	..	..	..	On 21st Deori 11·3″.
Balaghat	..	..	..	..	1·5	..	..	..	
West Bengal	Less than 1·0″								
North Gujarat									
Banaskantha	..	..	..	..	1·0	1·2	..	..	
Mehsana	..	..	..	..	..	1·4	..	..	
Sabarkantha	..	..	..	..	1·3	3·3	..	..	On 23rd—Idar 6·0″.
Kaira	..	..	..	..	..	1·0	..	..	
Rajasthan									
Sirohi	..	..	..	..	3·6	1·3	..	..	On 23rd—Sirohi 6·0″.
Pali	..	..	..	..	3·7	..	..	..	..
Ganganagar	..	1·0	..	..	..	..	..	..	..

State and district	District averages on 19th	20th	21st	22nd	23rd	24th	25th	26th	27th	Particularly heavy falls
Jodhpur	..	..	1·1	..	..	..	1·5	..	..	
Bundi	..	2·5	..	..	..	..	..	..	..	
Bikaner	..	..	..	..	..	..	1·1	..	..	
Churu	..	1·0	..	..	..	..	..	..	..	
Chittor	..	..	..	..	2·7	..	..	..	..	On 23rd—Nimbabora 5·3″.
Kotah	1·1	..	..	..	..	..	..	..	..	
Udaipur	..	..	..	..	1·9	2·1	..	..	..	On 23rd—Kherwara 5.4″. Sarara 8·2″. On 24th—Bikarani 6·7″.
Banswara	1·7	..	..	..	1·9	4·0	..	..	..	On 23rd—Jagpura 10·4″. On 24th—Banswara 6·4″, Garhi 7·2″,-Kushalgarh 6·9″, Khamera 9·0″, Danpura 5·5″.
Dungarpur	..	..	..	..	6·9	..		..	..	On 23rd-Dungarpur 7·0″, Sagwara 6·0″, Dhambola 8·0″, Nithawa 6·8″.
Tonk	1·0	..	..	..	..	..	..	..	..	
Jhunjhunu	..	..	..	..	..	1·4	..	..	..	
Bharatpur	1·6	..	..	..	..	..	..	..	..	
Sawai Madhopur	2.8	..	..	..	..	..	..	..	..	
Punjab (I)										
Hissar	..	..	..	..	..	..	2·6	..	..	
Ambala	..	..	..	..	..	..	..	1·1	..	
Simla	..	..	..	..	..	..	..	2·2	2·2	
Kangra	..	..	..	..	..	..	1·5	2·3	4·0	On 26th—Dharamsala obsy. 6·9″. On 27th—Hamirpur 7·0″, Dehra 6·3″, Kangra 5·6″.
Hoshiarpur	..	..	..	..	1·1	1·6	2·6	1·6	..	On 26th—Unnao 6·3″.
Jullundur	..	..	..	..	..	1·4	1·2	1·7	..	
Ludhiana	..	..	..	..	..	..	..	1·2	..	
Ferozepur	..	..	..	..	..	1·3	3·3	..	..	On 25th—Nathana 5·1″, Jalalabad 6·0″.
Amritsar	..	..	..	..	..	1·7	5·2	1·6	..	On 24th—Ajanala (C) 5·5″. On 25th—Bhuchar 7·4″, Khara 8·3″, Raya 8·6″, Ajnala 5·2″.
Gurdaspur	..	..	..	..	..	1·3	5·3	2 9	..	On 25th—Aliwal (C) 5·1″, Batala 5·1″, Guradaspur 5·2″, Pathankot 6·7″, Dalhousie obsy. 6·8″.

Orissa data not available.

9. Cyclonic storm in the Bay of Bengal—24th September to 1st October, 1954.—An easterly wave was noticed to be moving into the east central Bay across Burma on the evening of 24th September. By the next morning a strengthening of the monsoon was noticed over the south Bay and conditions became markedly unsettled over the east central and the adjoining west central Bay. Pressures were falling rapidly along the coast round the north and central Bay and widespread rain was reported from the Bay Islands. Moreover, an upper air cyclonic circulation extending up to 7,000 ft. a.s.l. was also noticed over the central Bay.

The unsettled conditions concentrated into a depression with centre at 1730 hrs. IST near Lat. 14·5°N and Long. 87·5°E. At that hour, S.S. Mozaffari (Lat. 16·5°N and Long. 88·0°E) reported eastnortheasterly winds 9 knots and S.S. Rotli (Lat. 11·4°N and Long. 86·9°E) westerly 28 knots and continuous rain. By the same evening, rainfall had commenced along the north Coromandel and the south Circars coasts. Moving slowly westnorthwest, the depression was centred at 0830 hrs. IST of the 26th near Lat. 15·0°N and Long. 87·0° E. At 0530 hrs. IST of that day, S.S. Bharat Mitra (Lat. 18·7°N and Long. 85·8°E) reported eastnortheasterly winds 13 knots and S.S. Mozaffari (Lat. 14·0°N

and Long. 86·5°E) westerly 9 knots. The latter ship with its location about 100 miles to the southwest of the centre of the depression reported a pressure of 998 mbs., about 12 mbs. below normal. The depression was, therefore, probably deep at this stage, although the wind speed reported by the ship does not support it. Pressures commenced rising in the Bay Islands and along the coasts of Burma, East Pakistan and West Bengal and continued to fall along the east coast of the Peninsula. Rainfall increased on the north Coromandel and the Circars coasts and also extended along the Orissa coast. The deep depression intensified into a cyclonic storm of small extent during the course of the day and was centred at 1730 hrs. IST near Lat. 15·5°N and Long. 86·0°E, as the following observations of the 26th would suggest :

Name of the ship	Position		Hour of obsn. IST	Wind		Remarks
	Lat. °N	Long. °E		Direction	Speed (knots)	
S. S. Indian Merchant	13·8	85·0	1730	WSW	35	Rainsqualls.
S. S. Mozaffari	12·3	85·4	1730	WSW	30	Overcast ; past weather drizzle.
S. S. Bharat Mitra	17·3	83·9	1730	NE	11	Overcast.

In the absence of Ship's observations near the centre, it is difficult to estimate the central pressure but taking into account the previous day's observation of S. S. Mozaffari, which showed a pressure departure of 12 mbs. and also the pressure departure observed later at the time of crossing the coast, it would appear that the pressure deficiency at the centre of the storm was at least of the order of 14 mbs. With the west-northwestward movement of the storms, pressures fell further along the Circars coast with a further increase in rainfall. At 0830 hrs. IST of the 27th, the storm was centred near Lat. 16.5°N and Long. 84.0°E. The following observations of 27th are relevant in this connection.

Name of the ship	Position		Hour of obsn. IST	Wind		Remarks
	Lat. °N	Long. °E		Direction	Speed (knots)	
S. S. Indian Merchant	16·7	86·7	0630	S	18	Overcast.
S. S. Hoeg Merchant	15·3	82·5	0830	W	37	Very rough sea, overcast.

Widespread rain with locally heavy to very heavy falls were reported from the Circars coast on the 27th morning, Gannavaram and Masulipatam recording 6″ and 5″ of rain respectively. On approaching the coast, the storm weakened into a deep depression and was centred at 1730 hrs. IST of 27th close to coast near Lat. 17·0°N, Long. 83·0°E. At that hour, S. S. Bharat Mitra (Lat 14·7°N and Long. 81·7°E) reported southwesterly winds 28 knots, Masulipatam westnorthwesterly 14 knots, Kakinada westsouthwesterly 4 knots and continuous drizzle and Visakhapatnam easterly 7 knots and intermittent rain. The deep depression crossed the coast between Kakinada and Visakhapatnam during the early hours of the night and lay next morning with its centre at 0830 hrs. IST near Nizamabad. The observed pressure deficiency near its centre was of the order of 13 mbs. Moving rapidly northwestwards, the deep depression was centred at 0830 hrs. IST of 29th near Khandwa. Khandwa has reported the lowest pressure. It moved slowly during the course of the day and it was centred at 0830 hrs. IST of 30th about 50 miles to the west of Ratlam. Recurving thereafter to the northeast, the deep depression lay between Agra and Gwalior on the morning of 1st October. It broke up over the hills of northwest Uttar Pradesh by the next morning.

In association with the storm, there was a spell of strong monsoon over the country. Widespread and locally heavy to very heavy rain fell along and near its track. Some noteworthy amounts of heavy rains reported are :

28th September — Bidar 7·4″, Rentachintala 6·1″.

30th September — Broach 7·6″.

1st October — New Delhi 6·8″, Dohad 5·0″.

The following table gives the district averages and noteworthy amounts of rainfall associated with the storm.

State and district	District averages on								Particularly heavy falls
	24·9	25·9	26·9	27·9	28·9	29·9	30·9	1·10	
Deccan (Desh)									
West Khandesh	..	..	..	..	—	3·2	4·0	..	On 30th—Taloda 6·5″, Shahada 6·2″, Shirpur 6·0″.
East Khandesh	..	..	..	..	—	2·8	..	..	On 29th—Pachora 6·9″.
Dangs	..	..	..	..	—	5·5	6·4	..	On 29th—Waghai 5·6″, Ahwa 5·5″; On 30th—Waghai 6·2″, Ahwa 6·6″.
Nasik	..	..	..	..	—	4·7	2·2	..	On 29th—Trimbak 5·5″, Pimpalgaon 7·5″, Nandgaon 6·1″, Satana 6·2″, Kalvan 5·5″, Chandor 6·7″, Dindori 5·1″, Peint 5·8;″ On 30th—Trimbak 5·3″, Peint 10·5″
Ahmednagar	..	..	..	..	..	..	2·3	..	
Sholapur	..	..	..	..	1·9	1·1	..	..	
North Satara	..	..	..	..	..	1·0	..	..	On 29th—Mahabaleshwar 6·9″.

State and district	District averages on								Particularly heavy falls
	24.9	25·9	26·9	27·9	28·9	29·9	30·9	1·10	
Gujarat									
Banaskantha	1·2	..	..	..	..	..	..	..	
Mehsana	1·4	..	..	..	..	..	..	..	
Sabarkantha	3·3	..	..	..	..	..	..	..	
Kaira	1·1	..	..	..	..	..	2·0	1·5	
Panchmahals	3·1	..	..	..	..	..	1·5	5·0	On 1st—Godhra 7·0″, Dohad 7·0″, Jhalod 5·8″, Baria 5·1″, Jambugoda 5·0″.
Amreli	..	..	..	..	..	2·1	..	--	
Baroda	2·6	..	..	..	..	..	4·3	3·9	On 30th—Jetpur 6·5″, Chota Udepur 5·9″, On 1st—Jetpur 5·8″.
Broach	..	..	..	..	1·2	4·3	3·2	..	On 28th—Sagbara 8·5″; On 29th—Hansot 5·7″, Vagra 5·7″, Amod 5·3″, Valia 8·5″ Bhalad 5·5″, Garadeswar 5·1″, Sagvara 7·3″, On 30th—Broach 7·0″, Ankleswar 6·1″, Rajpipla 7·9″, Dadiapada 7·3″.
Surat	..	..	..	..	..	3·0	6·4	..	On 30th—Surat 9·9″, Olpad 8·0″, Mandvi 5·1″, Bardoli 5·9,″, Valod 5·4″, Chikhli 6·0″, Bulsar 8·3″, Pardi 7·2″, Dharampur 8·4″, Bansada 6·6″, Navasari 5·6″, Mangrol 5·5″, Mahua 6·2″.
Saurashtra	..	..	..	..	..	1·0	1·3	..	On 30th—Palitana 6·5″, Mahua 9·5″.
Madhya Pradesh									
Raipur	..	..	1·2	..	..	..	..	..	On 26th—Bhatgaon 8·7″.
Raigarh	1·5	..	..	..	..	..	..	..	
Bastar	..	..	1·7	..	..	..	..	..	
Buldhana	..	..	..	..	..	1·9	..	..	
Yeotmal	..	..	..	..	1·2	..	..	..	
Uttar Pradesh									
Dehra Dun	..	..	..	1·1	..	..	..	1·9	
Saharanpur	..	..	..	..	..	..	..	1·3	
Muzaffarnagar	..	..	..	..	..	1·0	..	3·3	
Bareilly	..	1·3	..	..	..	..	..	1·3	On 1st—Debiabhoj 5·0″.
Bijnor	..	..	..	..	..	1·4	..	3·1	
Pilibhit	..	1·2	..	..	..	..	..	..	
Basti	..	..	..	..	..	..	1·3	..	
Azamgarh	..	..	..	..	..	..	1·1	..	
Nainital	..	..	..	..	..	1·0	..	1·9	On 1st—Kashipur 5·3″.
Almora	..	..	..	..	1·2	1·0	..	1·7	On 28th—Berinag 8·1″.
Sitapur	..	..	..	..	..	..	2·9	..	On 30th—Sitapur 5·8″.
Faizabad	..	..	..	..	..	..	1·2	..	
Bahraich	..	..	..	..	..	..	1·0	..	
Bara Banki	..	..	..	..	..	..	2·3	..	
Meerut	..	..	..	..	..	..	..	5·6	On 1st—Sardhana 6·4″.
Bulandshahr	..	..	..	..	..	..	..	4·1	On 1st—Khurja 6·2″.
Aligarh	..	..	..	..	..	..	..	3·6	
Mathura	..	..	..	..	..	..	..	2·6	
Agra	..	..	..	..	..	..	..	1·9	
Mainpuri	..	..	..	..	..	..	..	1·1	
Etah	..	..	..	..	..	..	..	1·7	
Budaun	..	..	..	..	..	..	..	1·5	
Moradabad	..	..	..	..	..	..	..	3·4	
Farukhabad	..	..	..	..	..	..	..	1·3	
Etwah	..	..	..	..	..	..	..	1·8	
Garhwal	..	..	..	..	..	..	..	1·9	

State and district	District averages on								Particularly heavy falls
	24·9	25·9	26·9	27·9	28·9	29·9	30·9	1·10	
Hyderabad									
Adilabad	..	..	..	1.0	..	..	..	..	
Aurangabad	..	..	..	..	3·6	2·5	..	..	On 28th—Khuldabad 5·2″, Bhokardan 6·0″ Silod 6·8″, Kanned 7·7″; On 30th—Vijapur 8·1″, Gangapur 5·7″.
Bidar	..	..	..	4·1	4·8	..	..	..	On 27th—Ahmedpur 6·2″, Udgir 6·2″, On 28th—Bidar 7·4″.
Bhir	..	..	..	1·3	2·5	1·2	..	..	
Karimnagar	..	..	..	1·2	..	..	..	..	
Medak	..	..	..	..	4·4	..	..	..	On 26th—Indole (Jogipet) 6·2″, On 28th—Pocharam 7·1′, Ananthagiri 5·9″, Ghanapur 7·2″, Nagasampalli 6·0″.
Nanded	..	..	..	1·9	2·2	..	..	..	
Nizamabad	..	..	..	..	4·4	..	..	..	On 27th—Banswada 5·7″; On 28th— Atchampet 11·6″, Alisagar 5·4″, Yelgattoor 5·3″, Bodhan 5·1″, Gunkul 10·5″, Yellareddy 6·9″.
Osmanabad	..	..	..	2·5	3·2	..	..	..	
Parbhani	..	..	..	1·8	3·1	..	..	..	
Gulbarga	..	..	..	3·1	..	..	..	..	On 27th—Chincholi 6·0″. Kodangal 6·3″, Aland 5 4″.
Hyderabad	..	..	..	..	3·4	..	..	..	On 28th—Bolaram 5·7″.
Mahbubnagar	..	..	..	1·3	2·4	..	..	..	On 27th—Perghi 6·1″; On 28th—Mahbubnagar5·4″, Mahbubnagar obsy. 5·4″.
Nalgonda	..	..	..	2·2	4·0	..	..	..	On 27th—Suriapet 5·8″; On 28th—Bhongir 6·1″, Pendli Pakala Project 5·4″, Huzurnagar 7·9″, Devarkonda 5·5″.
Warangal	..	..	..	2·8	1·9	..	..	..	On 27th—Baithpalli 5·3″, Wyra 7·8″; On 28th—Chinnaram 5·1″.

10. Deep depression in the Bay of Bengal—19th to 27th October, 1954.—A marked fall of pressure over south Tenasserim and south Andaman Sea and a cyclonic circulation up to 2,000 ft. over the area on the evening of 17th October, indicated that an easterly wave had moved into south Andaman Sea across the Tenasserim coast. By the next morning, a shallow trough of low pressure appeared over the southeast Bay with the associated cyclonic circulation extending up to 7,000 ft. and the monsoon strengthened over the south Bay of Bengal. The trough gradually intensified and by the evening of 19th, concentrated into a depression with its centre at 1730 hrs. IST near Lat. 8·5°N and Long. 89·0°E. At that hour, S.S. Roenordo (Lat. 05·9°N and Long. 85·9°E) reported northwesterly winds of 33 knots. The depression moved westnorthwest and was centred at 0830 hrs. IST of the 20th near Lat. 9·5°N and Long. 86·5°E. Pressures began to rise over the Bay Islands and fall over the south Peninsula and Ceylon. The monsoon continued to be active over the south Bay and widespread rain was reported from the Bay Islands on the 20th morning. By the evening, weather improved over the Bay Islands but an extensive belt of precipitation developed along and near the Coromandel coast. The depression was centred at 1730 hrs. IST of the 20th near Lat. 10·0°N and Long. 85·0°E. During the course of the night, it became deep and as it moved further westnorthwest, pressures fell rapidly along the Coromandel coast by the morning of 21st. The fall of pressure at 0830 hrs. IST at Cuddalore since 1730 hrs. IST of the previous evening, corrected for diurnal variation, was about 6 mbs. At 0830 hrs. IST of 21st, the depression was centred near Lat. 11·5°N and Long. 82·0°E as will be evident from the following observations of 21st.

Name of the ship/ station	Position Lat. °N	Position Long. °E	Time of obsn. IST	Wind Direction	Wind Speed (knots)	Remarks
S. S. Bharatmitra	14·7	81·4	0530	ENE	23	Moderate showers.
S. S. British Restraint	11·4	82·7	0930	SE/E	33	Frequnt heavy showers, rough sea.
Madras	..	..	0830	ENE	7	Intermittent rain.
Cuddalore	..	..	0830	NW	5	Moderate drizzle.

Widespread and locally heavy to very heavy rain occurred in Ceylon and the Coromandel coast, Cuddalore reporting 8″ and Madras and Mannar recording 6″each on 21st morning. The estimated pressure deficiency at the centre of the depression was 10 mbs. Continuing to move westnorthwest, it weakened and was centred close to coast between Cuddalore and Madras at 1730 hrs. IST of 21st. Passing inland, it lay as a shallow depression on the 22nd morning, with its central region between Vellore and Nellore. At 1730 hrs. of the same evening, it lay as a low pressure area over north Tamilnad, causing an extensive rain belt towards northeast. Thereafter, the low pressure area recurved towards the northeast and extended on the next morning (23rd) from north Tamilnad to west central Bay. A well marked rain belt extended from Mysore to south Orissa and pressures began to rise over Ceylon and the south Peninsula. On the 24th morning, the trough of low pressure shifted northeastwards and extended from southeast Hyderabad to west central Bay off the Circars coast, with the associated upper air circulation extending up to 5,000 ft. Widespread and locally heavy to very heavy rain occurred in coastal Andhradesa and south coastal Orissa on that day, Gopalpur recording an exceptionally heavy fall of 20″. Puri recorded 6″ and Calingapatnam 5″. By 1730 hrs. IST of 24th, a depression again formed with centre near Lat. 17·0°N and Long. 85·0°E. There was a concentrated fall of pressure along the Orissa Circars coast and the upper air cyclonic circulation over the west central Bay became more accentuated; S.S. Indian Merchant (Lat. 15·7°N and Long. 85·8°E) reporting southsouthwesterly winds 18 knots and heavy continuous rain and Calingapatnam eastnortheasterly winds of 7 knots and thunderstorm. Moving northeastwards, the depression was centred at 0830 hrs. IST of 25th near Lat. 19·0°N and Long. 86·5°E. At that hour, Sandheads reported southeasterly winds of 14 knots and slight continuous rain. The estimated pressure deficiency at the centre of the depression was 8 mbs. Thereafter, there was an increase of rainfall along the West Bengal coast and a decrease along the Circars and the South Orissa coasts. The upper winds over Gangetic West Bengal and adjoining East Pakistan strengthened up to 10,000 ft. a.s.l. The depression deepened by the evening of 25th and was centred at 1730 hrs. IST near Lat. 20·5°N and Long. 87·5°E. The pressure deficiency at the centre was estimated to be about 10 mbs. At 0830 hrs. IST of 26th, the deep depression was centred near Lat. 21·0°N and Long. 89·0°E. The following observations of 26th are relevant in this connection.

Name of the ship/ station	Position Lat. °N	Position Long. °E	Time of obsn. IST	Wind Direction	Wind Speed (knots)	Remarks
S. S. Jalaprakash	20·5	88·6	0530	W	03	Overcast sky.
S. S. Jalayamuna	19·5	88·7	0530	WSW	24	Drizzle.
Balasore	..	..	0830	N	13	
Saugor Island	..	..	0830	ENE	5	Slight continuous rain.

The pressure deficiency at the centre of the deep depression was observed to be about 13 mbs. There was widespread rain around the head Bay, the rainfall being heavy in East Pakistan. Faridpur reported 4″ and Khulna, Dacca, Majdee and Chittagong 3″ each during 24 hours ending at 0830 hrs. IST of 26th. The disturbance continued to move northeastwards and pressures began to rise considerably over the coasts of Orissa and adjoining West Bengal, where an improvement of weather was also noticed. Towards the afternoon of 26th, the upper winds over Gangetic West Bengal backed from north to northwest, while a further fall of pressure and an increase of rainfall was observed over East Pakistan and adjoining Assam. At 1730 hrs. IST of 26th, the deep depression was close to East Pakistan coast near Lat. 22·0°N and Long. 90·0°E and showed signs of weakening. At this hour, the pressure departure at the centre of the depression was of the order of −10 mbs.; Chittagong reported easterly winds 3 knots and moderate continuous rain, Barisal northeast 2 knots and slight continuous rain, Sandheads northwest 19 knots and overcast sky and Akyab south 16 knots and slight continuous rain. By the 27th morning, the depression crossed the East Pakistan coast, weakened into a low pressure area and moved further towards the northeast. At 0830 hrs. IST of 27th, it lay as a low pressure area over East Pakistan and adjoining lower Assam. With the northeasterly movement of the depression, widespread and locally heavy rain occurred again over East Pakistan and extended into Assam. The chief amounts of rainfall which were recorded during the 24 hours ending at 0830 hrs. IST of 27th are: Haflong 9″, Chittagong, Akyab and Cherrapunji 4″ each and Comilla and Majdee 3″ each. The low pressure area broke up over the Assam hills by the evening of the same day.

The following table gives the district averages and the noteworthy amounts of rainfall associated with the depression.

State and district	District averages on									Particularly heavy falls
	18th	19th	20th	21st	22nd	23rd	24th	25th	26th	27th	
Tamilnad											
Madras	..	..	..	4.1	1·2	1.2	..	..	..	..	
Chingleput	..	1·5	1·3	4.5	1·3	..	..	..	..	..	On 21st—Cheyyur 7·3″, Kancheepuram 5·7″ Covelong 6·2″, Meenambakkam 5·8″, Saidapet 5·5″, Madurantakam 6·0″, Chingleput 5·8″, Chembarambakkam 5·1″.
North Arcot	..	..	..	3.5	2·5	..	..	..	..	..	On 21st—Cheyyar 6·9″, Vakkadai 6·2″, Dusi (Ayyankulam) 5·9″.
South Arcot	..	..	1·0	5.5	1·5	..	..	..	..	..	On 21st—Merkanam 9·2″, Vanur 8·4″, Villupuram 7·9″, Panruti 7·0″, Cuddalore 8·0″ Kurinjipadi 8·5″, Porto Novo 10·5″, Chidambaram 9·2″, Kattumannarkoil 6·7″, Srimushnam 5·1″, Viriddhachalam 5·1″, Ulundurpet 8·3″, Tirukoyilur 5·7″, Vanamadevi Anicut 5·8″, Shatiatope Anicut 6·8″, Kothavancheri 5·7″, Tirukkoyilur Anicut 5·9″.
Tanjore	1·2	1·0	3·7	2·6	..	..	..	..	..	..	On 20th—Nannilam 5·4″, Tiruturaipoondi 14·3″, Vedaranyam 6·2″, Mannargudi 7·5″, Nidamangalam 5·3″, Tiruppundi 7·7″, Adirampattinam 7·0″, Muthupet 5·2″, Madukkur 5·0″ Talanayar 6·8″.
											On 21st—Mayuram 8·1″, Tranquebar 5·8″ Sirkali 9·0″, Vedaranyam 7·6″, Neidavasal 10·8″, Manalmedu 6·6″, Coleroon 8·1″.
Trichy	..	..	1·1	..	..	..	..	..	..	..	
Pudukottai	..	1·0	1·8	..	..	..	..	..	..	..	
Madurai	1·2	..	..	..	..	..	..	..	..	..	
Salem	..	1·0	..	1·2	1·7	..	..	..	..	..	
Coimbatore	1·1	..	1·3	..	..	..	..	..	..	..	
Nilgiris	1·1	..	1·2	1·7	1·2	..	..	..	..	..	
Gangetic West Bengal											
24 Parganas	..	..	..	..	..	..	1·0	1·1	..	..	
Murshidabad	..	..	..	..	..	..	..	1·0	..	..	
Birbhum	..	..	..	..	..	..	..	..	1·1	..	
Midnapore	..	..	..	..	..	..	..	..	..	..	On 24th—Ramnagar 5·8″.
Hooghly	..	..	..	..	..	..	1·1	..	..	..	
Coastal Andhradesa											
Srikakulam	..	..	..	..	..	4·5	4·0	..	..	..	On 23rd—Narasannapetta 6·3″, Parvathipur 5·0″, Palkonda 6·3″, Tekhali 9·0″.
											On 24th—Calingapatam 5·0″, Cheepurapalli 5·2″, Pathapatnam 5·8″, Sempeta 6·4″, Pundi 7·0″, Tekkali 5·1″.
Visakhapatnam	..	..	..	..	1.5	4·8	1·9	..	..	..	On 23rd—Srungavarapukota 7·7″, Chodavaram 5·5″, Narasapatam 7·9″, Malakapuram 5·2″, Yellamanchili 5·9″, Polavaram 6·3″, Pulaparti 7·5″.
East Godavari	..	..	..	..	1·4	3·6	1·3	..	..	..	On 22nd—Biccabole 5·1″.
											On 23rd—Tuni 5·5″, Pithapuram 6·7″, Pratiapudu 6·6″, Peddapuram 6·4″, Alamuru 6·6″ Ralli 8·4″, Gopalapuram 5·3″, Alamur 6·7″, Kakinada 5·9″.
West Godavari	..	..	..	..	1·6	2·8	1·3	..	..	..	On 23rd—Tanuku 5·5″, Chettipeta 5·9″, Lakshmipalem 5·3′.
											On 24th—Chinakepevaram 5·0″.
Krishna	..	..	..	..	1·4	3·1	1·2	..	..	..	On 23rd—Avanigadda 5·6″, Akumarru 5·5″, Kamalapuram 5·4″, Paligadda 5·3″, Kodur 10·7″, Kottapallem 5·5″.

State and district	District averages on 18th	19th	20th	21st	22nd	23rd	24th	25th	26th	27th	Particularly heavy falls
Coastal Andhradesa—contd.											
Guntur	..	..	..	..	1·5	3·4	..	..	..	..	On 23rd—Repalli 6·9", Chinaganjam 6 5", Ongole 6·2", Kanuparti 5·3", Nallaveda 5·1", Nizampatam 7·4", Pedagangam 6·3".
Nellore	..	1·0	..	2·9	5·9	1·7	..	..	..	..	On 21st—Kavali 5·2", Gudur 5·7", Rapur 5·8"- On 22nd—Atmakur 7·1", Udayagiri 6·3", Pakala 5·4", Kavali 13·3", Iskapalli 8·7" Nellore 6·1", Gudur 8·0", Rapur 5·5" Venkatagiri 7·3", Sulurpet 5·7", Tada 9·4" Buchireddipalem 5·6", Sangum 7·5" Survey palli 8·1", Pumbli 6·7",.
Kurnool	..	..	..	..	..	1·0	..	..	..	..	On 23rd—Pakala 6·4".
Anantapur	..	..	..	..	1·6	..	..	..	..	..	
Cuddapah	..	..	1·0	1·1	3·9	..	..	..	..	..	On 20th—Kodur 6·1", Brahmanpalli 7·3". On 22nd—Sidhout 6·0", Chitvel 6·0", Vempali 6·5", Vonipenta 5·7".
Chittoor	..	..	1·3	2·2	3·8	..	..	..	..	..	On 20th—Tirupati 5·2", Pakala 9·3", On 21st—Kalahasti 5·7"; On 22nd—Puttur 5·5" Kalahasti 6·7", Tirupati 6·3", Chanragiri 9·8 Pallipat 5·8", Sodam 8·3", Arogyavaram 6·2", Bakarapet 6·1", P.T.M. 7·0". On 23rd—Madanapalli 6·0".

11. Depression in the Bay of Bengal—7th to 12th December, 1954.—In association with the passage of a low pressure wave westwards across the extreme south Bay, the seasonal 'low' became well-marked over the Bay of Bengal on the 7th morning, when the easterlies strengthened over the Andamans and Ceylon and widespread rain occurred over these areas. At 0530 hrs. IST of that day, S.S. Lang Koes (Lat. 5·8°N and Long. 82·8°E) reported northeasterly winds of 15 knots and intermittent rain, S.S. Orange (Lat. 5·8°N and Long. 87.3°E) southerly winds of 13 knots and continuous drizzle, and S.S. Jalamohan (Lat. 8·9°N and Long. 85·7°E) northeasterly winds of 11 knots and squally weather. The well-marked trough shifted northwards and on the 8th morning it concentrated into a shallow depression with its central region near Lat. 8·0°N and Long. 86·0°E. The following observations are significant in this connection.

Name of the ship/ station	Position Lat. °N	Long. °E	Hour of obsn. IST	Wind Direction	Speed (knots)	Weather remarks
S. S. Malika	10·0	87·5	0530	E	18	Showery
S. S. Jalamohan	11·1	88·5	0530	ENE	13	Moderate rain
S. S. Bharatjal	12·2	84·3	0530	NE	18	Continuous rain.
S. S. Tomha	5·6	85·2	0530	WSW	3	Overcast.
Trincomalee	..	..	0830	NNE	12	Drizzle.

During the course of the next 24 hours, the trough shifted northwest and lay on the morning of 9th as an extended trough off the south Coromandel and Ceylon coasts. At that time, pressures were falling along the Coromandel coast and Ceylon but were rising over the rest of the country.

Widespread and locally heavy rain was reported from Ceylon on the 9th morning and rainfall extended northwards into Coromandel coast during the day. The trough then shifted northwards and on the morning of the 10th had concentrated into a shallow depression centred at 0830 hrs. IST near Lat. 10·5°N and Long. 82·5°E. At 0530 hrs. IST of the day, S.S. Jalaprakash (Lat. 11:2°N and Long. 82:3°E) reported easterly winds of 13 knots and S.S. Union Builder (Lat. 11·9°N and Long. 80·8°E) reported northerly winds of 10 knots and continuous rain. The northeast monsoon strengthened over Tamilnad and Travancore-Cochin. The pressure deficiency at the centre of the depression was estimated to be about 6 mbs. The shallow depression intensified during the day and was centred at 1730 hrs. IST near Lat. 11·0°N and Long. 82·5°E. The following observations are relevant in this connection.

Name of the ship/ staion	Position Lat. °N	Long. °E	Hour of obsn. IST	Wind Direction	Speed (knots)	Weather remarks.
S. S. Bahadur	12·7	86·6	1730	SSE	14	Squally weather.
S. S. Jalaprakash	9·4	82·3	1730	W	18	Overcast.
Madras	..	..	1730	N	16	Moderate continuous rain.
Cuddalore	..	..	1730	Calm	..	Slight continuous rain.

Moving northwards, the depression was centred at 0830 hrs. IST of 11th near Lat. 12·5°N and Long. 82·5°E. At 1130 hrs. IST S.S. Hesparia (Lat. 11·0°N and Long. 8·0°E) reported southerly winds of 13 knots while Madras reported northnorthwesterly winds of 13 knots and drizzle. During the course of the day, rainfall increased considerably along the north Coromandel and Circars coasts but decreased in Ceylon and along the south Coromandel coast. The depression which continued to move northwards was centred at 1730 hrs. IST near Lat. 13·5°N and Long. 82·5°E. At that hour, the pressure deficiency at Madras was observed to be 6 mbs. and that at the centre of the depression was estimated to be about 8 mbs. S.S. Bharatratna which was close to the coast near Kakinada reported northeasterly winds of 20 knots, while Madras reported northnorthwesterly winds of 20 knots and continuous rain. The depression remained practically stationary till the 12th morning and weakened by 1730 hrs. IST into a trough of low pressure extending from north Tamilnad and adjoining southwest Bay to Travancore-Cochin. The trough weakened further into a low pressure area by the morning of 13th and moved westwards into the east Arabian Sea during the course of the day. On the 14th morning, the low pressure area lay over the east Arabian Sea off the Malabar-Kanara coasts and by the next day it became unimportant.

In association with the depression, there was a spell of active northeast monsoon conditions over the south Peninsula from the 12th to 15th. The following table gives the district averages and the noteworthy amounts of rain during this period.

State and district	District averages on 7th	8th	9th	10th	11th	12th	Particularly heavy falls
Tamilnad							
Madras	..	..	..	2·4	2·1	2·2	On 10th—Cheyyur 5.7″.
Chingleput	..	..	..	2·2	1·8	1·9	Mahabalipuram 6.1″.
South Arcot	..	..	..	2·6	..	..	On 10th—Merkanam 5.7″, Cuddalore 5.4″, Porto Novo 5.4″, Chidambaram 5.5″, Vanamadevi 5.3″.
Tanjore	..	..	..	4·9	..	..	On 10th—Valangiman 5·1″, Mayuram 12·5″ Tranquebar 6·6″, Sirkali 7·8″, Nannilam 11·5″, Nagapattinam 5·9″, Tiruvarur 7·9″, Vedaranyam 6·1″, Mannargudi 5·4″, Neidavasal 7·3″, Tiruqundi 14·0″, Manjalar Head 6·2″, Coleroon 6·0″, Pandavayar Head 5·9″, Talanayar 6·7″.
Tiruchirapally	..	..	..	1·4	..	..	
Pudukottai	..	..	..	1·6	..	..	

12. Cyclonic storm in the Bay of Bengal—16th to 18th December, 1954.—On the 13th morning, the trough of low in the extreme south Bay was well marked and a low pressure wave was apparently moving westwards across south Andaman Sea. By next morning, the easterly winds at Victoria Point had strengthened considerably and a speed of 50 knots was recorded at 5,000 ft. During the course of the next 36 hours, the trough of low in the extreme south Bay got accentuated and by the evening of 15th, conditions became markedly unsettled in the extreme south Bay to the south of Lat. 6·0°N. The unsettled conditions concentrated into a depression by the morning of the 16th with its centre at 0530 hrs. IST near Lat. 5·0°N and Long. 85·5°E. S.S. Fujisamaru (Lat. 6·0°N and Long. 85·0°E) reported northeasterly winds of 15 knots at the hour. There was a fresh surge of equatorial maritime air into the extreme south Bay at the same time. At 0830 hrs. IST, Kondul recorded 3″ of rain and Batticola reported moderate continuous rain. The depression intensified rapidly into a cyclonic storm of small extent and was centred at 1130 hrs. IST of the same day near Lat. 5·5°N and Long. 85·0°E. At that hour, S.S. Dunera (Lat. 5·6°N and Long. 84·1°E) reported northnorthwesterly winds of 50 knots and heavy continuous rain. No appreciable movement of the cyclonic storm was noticed till 1730 hrs. IST when S.S. Dunera (Lat. 5·2°N and Long. 84·9°E) reported westnorthwesterly winds of 31 knots and S.S. Kirriemoor (Lat. 6·5°N and Long. 86·5°E) reported southeasterly winds of 15 knots. Thereafter, the storm moved northwards, weakening at the same time and lay as a depression with its centre at 0530 hrs. IST of 17th near Lat. 8·5°N and Long. 84·0°E. Continuing to move in a northerly direction, it was centred near Lat. 10·0°N and Long. 84·0°E at 1730 hrs. IST when S.S. Bharatratna (Lat. 12·1°N and Long. 82·5°E) reported northeasterly winds of 15 knots and S.S. Rajula (Lat. 8·7°N and Long. 82·2°E) reported northwesterly winds of 15 knots at 1830 hrs. IST. By the next morning the depression weakened further into an extended trough of low pressure over the southwest and adjoining west central Bay. It persisted there until the 23rd and became unimportant thereafter.

In association with the cyclonic storm, there was a revival of northeast monsoon conditions along the east coast, but the associated rainfall was not significant.

II. ACCOUNT OF WESTERN DISTURBANCES DURING 1954.

Most of the western disturbances which passed across the northern parts of the country during January and February were active and caused good precipitation in northwest India and Uttar Pradesh. The western disturbances during the remaining months of the year were, on the other hand, feeble and did not cause any significant amount of precipitation.

A list of 43 western disturbances classified according to the nature of the precipitation caused by them together with a short description of some of the active ones is given below.

Nature of precipitation	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Widespread	3	4	1	..	..	..	..	..	..	..	..	1
Local	..	1	1	..	1	..	..	..	..	1	..	..
Little or no rain	2	3	2	5	4	..	..	..	..	3	6	5
TOTAL	5	8	4	5	5	..	..	..	..	4	6	6

1. Western disturbances from the 6th to 12th January, 1954.—A western disturbance moved into south Baluchistan and adjoining north Arabian Sea on the 6th. It persisted there on the 7th, when another western disturbance moving along a more northerly course lay over the Punjab(P) and neighbourhood. The low pressure areas associated with the two western disturbances merged into a complex 'low' on the 8th and extended from Madhya Bharat and adjoining Uttar Pradesh to the northern divisions of West Pakistan. This 'low' moved slowly eastwards and broke up over the western Himalayas by the 10th. A shallow low pressure area which developed over Vindhya Pradesh under the influence of the western disturbances moved slowly eastwards and broke up over the Assam Himalayas on the 12th. In association with these disturbances, fairly widespread thundershowers occurred in the Punjab(I) and northwest Uttar Pradesh on the 8th, in the Punjab-Kumaon hills and Vindhya Pradesh on the 9th and 10th and in Bihar and east Uttar Pradesh on 10th. Fairly widespread snow was reported from Jammu and Kashmir between the 9th and 11th. Local or scattered thundershowers were also reported from Rajasthan and Saurashtra and Kutch on the 8th, from the plains of the Punjab(I) and of Uttar Pradesh, Vindhya Pradesh and Madhya Pradesh on the 9th and from Assam on the 11th and 12th. Fairly widespread snowfalls were also reported from the Punjab-Kumaon hills on the 9th and 10th and from the Punjab hills on the 11th. Some significant amounts of rainfall recorded during the above period were: Dalhousie 2″ on the 8th and Nainital 2″ on the 10th.

In the wake of the western disturbances, cold northerly air swept over northwest India, Uttar Pradesh, the central parts of the country and the adjoining parts of the north Peninsula. A moderate cold wave prevailed over Gujarat, north Deccan (Desh), east Rajasthan, Madhya Bharat and the adjoining parts of west Madhya Pradesh between the 10th and 12th, when the minimum temperatures were 6° to 12°F below normal over these regions.

2. Western disturbance from the 17th to 23rd February, 1954.—A western disturbance moved into west Baluchistan and neighbourhood on the 17th. Taking a northeasterly course, it lay over the Northwest Frontier Province and the adjoining parts of the Punjab(P) on the 19th and induced a low pressure area over south Madhya Bharat and adjoining southeast Rajasthan on the same day. By the 21st, the western disturbance had moved away across the western Himalayas, while the induced 'low' lay over southwest Uttar Pradesh and neighbourhood. The 'low' moved slowly eastwards and became unimportant, by the 23rd. In association with these disturbances, local or fairly widespread thundershowers occurred in the Punjab(I) and the hills of west Uttar Pradesh between the 19th and the 21st; in the plains of Uttar Pradesh and Vindhya Pradesh on the 20th and 21st; in Rajasthan, Madhya Bharat and northwest Madhya Pradesh on the 20th; in Bihar on the 21st, in Chota Nagpur on the 22nd and in Sub-Himalayan West Bengal on the 22nd and 23rd. Local rain or snow was also reported from Jammu and Kashmir on the 19th and 20th. The principal rainfall amounts reported during the above period were: Jaipur and Roorkee 2″ each on the 20th and Nainital, Najibabad and Aligarh 2″ each on the 21st.

III. LOCAL STORMS, 1954.

Of the local storms reported in the newspapers, the following are noteworthy

Place	Date and time	Classification of storm	Loss of human life	Remarks
Dahanu	8th January	Gale	4	A large fishing craft sank off the Thana coast in a gale as a result of which three sailors were reported missing and one drowned.
Nainital	9th January—Night	Severe hailstorm	..	The severe hailstorm which followed the snowfall caused much damage to fruit plants and standing crops.
Calcutta	24th February—Night	Nor'wester	..	As a result of the Nor'wester, the temperature fell by 22°F (from 88°F to 66°F). The maximum wind speed was 40 m.p.h. at Alipore and 55 m.p.h. at Dum Dum.

Place	Date and time	Classification of storm	Loss of human life	Remarks
Silchar	24th February—Night	Thunderstorm	..	The storm caused heavy damage to private property, railway quarters and mango crops. Some kutcha houses were razed to the ground. Electric and telephone wires were snapped by falling trees. The whole town was plunged in darkness due to the failure of electric supply.
Karimganj	24th February—Evening	Thunderstorm	..	More than 100 houses either collapsed or were badly damaged by the cyclone. Telegraph and telephone communications were dislocated.
Khari Nimgaon (Near Ahmednagar)	20th March—Night	Thunderstorm	3	Three members of a family were struck dead by lightning.
Patiala	24th March—Night	Severe hailstorm	..	Caused damage to standing crops.
Jabalpur	27th March	Duststorm followed by heavy shower.	..	A few trees were uprooted and telephone and electric lines dislocated.
Habra-Baigachi Area (24 Parganas)	4th April —Afternoon	Gale followed by hail-storm.	1	One person was killed as a result of house collapse and several were injured when huts were ripped off by the gale. Nearly 500 houses were seriously damaged.
Hailakandi (Assam)	6th April	Thunderstorm	2	Widespread damage to property was caused. A number of houses collapsed. Loss was estimated at Rs. one lakh.
Nowgong	13th April—Evening	Severe thunderstorm	2	Two persons were killed in a house collapse. Roofs of many thatched houses were blown off. Many trees were uprooted.
Tezpur	15th April—Night	Severe thunderstorm	1	5,000 people were rendered homeless. Telegraph and telephone poles were twisted, trees uprooted and roofs of houses blown off. Damage to Government and private property was estimated at over one crore of rupees.
Mangalore	22nd April—Night	Gale accompanied by thundershower.	1	A seven-year old girl was killed and two women were seriously injured when an uprooted tree fell over their house as a result of the gale. Electric supply and telecommunications were affected. Thousands of tiles from house tops were blown off.
Villages around Trichur	22nd April	Severe thunderstorm	..	Roofs of more than a hundred houses were blown off and many trees were uprooted by the cyclone. The loss was estimated at about one lakh of rupees.
Tellicherry (Dist : Malabar)	23rd April—Evening	Thunderstorm	4	Four persons were killed and one sustained serious burns as a result of a thunderbolt falling on a tea shop.
Punganur (near Madanapalli)	25th April	Hailstorm and strong gale	..	Mango groves over an extensive area and standing paddy crop over 400 acres were damaged.
Calcutta	29th April—Afternoon	Nor'wester	..	The Nor'wester tore off tin and tiled roofs of several houses and uprooted a number of trees. Maximum wind velocity was 46 m. p. h. in Alipore and 62 m. p. h. in Dum Dum. Five persons were injured as a result of house collapses.
Madurai	2nd May—Night	Severe gale and dust-storm.	2	Telegraphic and telephonic communications were disrupted. A woman was fatally injured by a falling tree and a man was struck dead by lightning.
Calcutta	2nd May—Night	Nor'wester	..	Wind speed reached 44 m. p. h. at Dum Dum. The Nor'wester caused a drop of ten degrees F in the temperature.
Patna	2nd May—Night	Severe hailstorm and thundershowers.	..	The storm uprooted trees and telegraph poles and snapped electric and telegraph wires. Many birds were killed by falling hail. Some of the hailstones were as big as billiard balls. Maximum wind speed was 64 m. p. h.

Place	Date and time	Classification of storm	Loss of human life	Remarks
Bettiah (Dist : Motihari)	2nd May—Night	Violent storm	2	Two persons were killed and 60 injured when the storm struck a train at about 8 P.M. Six out of the eight boggies of the passenger train were derailed. A second class coach was smashed to pieces.
Hubli	4th May—Evening	Gale	..	A 50 m. p. h. gale dislocated telephone and telegraph communications. A few huts were blown off.
Tanjore	4th May—Night	Gale accompanied by rain and thunder.	1	Mud walls of some huts collapsed and roof tops of a few houses were blown off by the gale. Trees were uprooted at some places. A ten year old girl was crushed to death as a result of wall collapse.
Ambala	5th May—Night	Thunder-squall	..	Several trees were uprooted and telegraph communications interrupted by the squall. Wind speed was 50 m.p.h.
Calcutta	6th May—Night	Nor'wester	..	The temperature dropped by 14°F. Maximum wind speed at Alipore was 34 m.p.h.
Panipat (Near Delhi)	10th May	Hailstorm	2	Two persons died and three were seriously injured when tin roofs of three shops were blown off by a hail storm. The storm uprooted mango trees and blew away many roofs and city walls.
Gandhigram (Madurai)	12th May—Evening	Duststorm	..	The storm caused widespread damage to trees and huts. One building with two feet thick granite wall fell down crumbling. The damage was estimated at Rs. 7,000.
Chittoor (Rayalaseema)	13th May—Evening	Severe gale	..	Roofs of many buildings were blown off and trees were uprooted. Telegraph and telephone communications were interrupted due to failure of electricity. Walls of several buildings collapsed.
Calcutta	14th May—Afternoon	Nor'wester	..	The Nor'wester brought down the temperature by 21°F. Maximum wind speed was 61 m.p.h. at Alipore and 66 m.p.h. at Dum Dum.
Calcutta	20th May—Evening	Thundersquall	2	The storm affected air and road traffic. Two persons were electrocuted when high tension wire fell on the corrugated roof of their hut during the storm.
Faridpur	20th May	Tornado	..	Thousands of houses were blown off and big trees were uprooted.
Tiruvannamalai (Madras State)	21st May—Evening	Severe gale	..	Many trees were uprooted and some buildings were destroyed.
Akaltara (Dist : Bilaspur)	1st June—Evening	Hailstorm	1	Roofs of houses were blown off and trees fell down by the strong wind. One person was killed due to falling of a tree.
Bettiah and adjoining villages (Dist.Motihari)	: 1st June	Thunderstorm	1	Two hundred huts were blown off, about a thousand trees uprooted and 20 cattle killed by the cyclone. One person was killed by the falling of a tree.
Marmagao	4th June	Storm	..	'Evgemia' a 7400 ton freighter poundered off the harbour and split into two.
Lucknow	5th June—Morning	Duststorm	..	The wind speed reached 52 m.p.h. Telephone and teleprinter communications were paralysed.
Banaras	7th June	Duststorm	1	One woman was killed when the duststorm knocked her off from the third story roof of her residence. Electric supply and communications were also disrupted.
Nagpur	22nd June—Midnight	Gale and thundershower.	..	Night air mail services were dislocated. Low lying areas were flooded. Over 100 telephone lines were out of order.

Place	Date and time	Classification of storm	Loss of human life	Remarks
Calcutta	29th June—Afternoon	Strong gale	..	Air services were dislocated.
Bombay	6th July—Early morning	Terrific gale	..	Numerous trees were uprooted. All traffic on air, sea and land were dislocated and two persons were injured by a falling tree. Wind velocity was 60 m. p. h.
Baripada	21st July—Afternoon	Severe thunder storm	..	Electric posts and trees were uprooted and roofs of several buildings were blown off, resulting in injuries to seven persons.
Delhi	3rd October—Evening	Gale accompanied by thunder showers.	..	The gale pulled down the roofs of thatched structures and uprooted a number of trees. Maximum wind speed reached was 54 m. p. h.
Amritsar	3rd October—Evening	Thunderstorm and gale.	..	Air services were affected.
Kangode (Near Trivandrum)	17th December—Afternoon	Thunderstorm	2	The primary school building collapsed injuring thirty school children of which two died later. A dozen houses were damaged and about 1000 plants in a bannana grove destroyed.
Saragfola (Dibrugarh)	28th December—Afternoon and night.	Hailstrom	..	The hailstorm damaged ripe sali paddy crops. Hailstones were reported to be of the size of plums.

IV. WINDS OF FORCE NINE OR MORE IN THE INDIAN SEAS

Excluding dates of storms and depressions, a description of which has been given above, winds of force 9 or more were recorded on ships in the Indian Seas during the year 1954 on the following occasions:—

Date	Name of ship	Approximate position	
		Lat.°N	Long. °E
23-5-54	Lanarseillaise	07·1	71·1
5-6-54	Silver Oak	11·7	58·0
9-6-54	Empire Halladale	12·5	55·9
9-6-54	Empire Halladale	12.9	55.1
7-7-54	Mohammedi	12.2	57.6
8-7-54	Mohammedi	12.8	55.9
8-7-54	Name not known. Picked up from W/T broadcast	13.0	55.5
11-7-54	Asca	16.5	55.5
6-8-54	Name not known. Picked up from W/T	12.2	47.5

No ship in the Bay of Bengal reported wind force of 9 B.F. or more unconnected with cyclonic storms during the year 1954.

PUBLICATIONS OF THE INDIA METEOROLOGICAL DEPARTMENT

(Complete list, up to July 1959, including those Publications which are now out of print.)

Notes:—

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2. INDIAN DAILY WEATHER REPORT, WEEKLY WEATHER REPORT, AND MONTHLY WEATHER REPORT ARE AVAILABLE FOR SALE IN THE OFFICE OF THE DEPUTY DIRECTOR GENERAL OF OBSERVATORIES (FORECASTING), METEOROLOGICAL OFFICE, POONA-5.

3. DAILY REGIONAL WEATHER REPORTS FOR CALCUTTA, NEW DELHI, NAGPUR, BOMBAY AND MADRAS ARE AVAILABLE FOR SALE AT THE RESPECTIVE REGIONAL METEOROLOGICAL CENTRE.

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Instructions to observers at the Surface observatories, Part I (1954) Rs. 3-10-0.	Departmental.
Cloud Atlas, edition 3. (1945). Rs. 2-2 or 3*s.* 6*d.**	Ditto.
Tables for the Reduction of Meteorological Observations in India, Reprint of 3rd edition (1947).* Rs. 5-12.	Ditto.
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Hygrometric Tables (1000 mb.) edition 2 (1949). As. 14 or 1*s.* 3*d.*	Ditto.
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Hygrometric Tables (700 mb.) 1944.	Ditto.
Hygrometric Tables, Vapour Pressure.* Rs. 3-8 or 5*s.* 6*d.*	Ditto.
Saturation Temperature Tables (1942). As. 10.	K. N. Rao.
Rainfall Registration (1956).	Departmental.
Service Instructions for Part-time Observers (1952).	Ditto.
Instructions for making entries in Pocket Register and Monthly Meteorological Register.	Ditto.
Weather Code (1955).	Ditto.
Brief Weather Code (1949). Rs. 1-6 or 2*s.*	Ditto.
Aviation Weather Codes (1955).	Ditto.
Codes for reporting upper Winds and Cloud Directions (1955).	Ditto.
Code for Upper Air Reports (1955).	Ditto.
Ships' Weather Code (1949). Rs. 1-10 or 2*s.* 6*d.*	Ditto.
Reports on the Meteorology of India for the years 1875—1890 (16 volumes). Each Rs. 10.†	Ditto.
Meteorology of the Bombay Presidency (1878).*	C. Chambers.
Weather and the Indian Farmer (1946).*	Departmental.
Meteorology in India.	Ditto.
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India's Climates—Summary for Airmen (1943). Re. 1 or 1*s.* 6*d.*	Ditto.
Meteorological Organisation for Airmen, M.O.A. pamphlet (1949).	Ditto.
Meteorological Conditions affecting aviation over the Northwest Frontier (1934). Rs. 1-8 or 2*s.* 6*d.*	R. G. Veryard and A. K. Roy.

III. ATLASES AND CHARTS.—

Climatological Atlas of India (1906).* Rs. 27.	Sir John Eliot.
Meteorological Atlas of the Indian seas and the North Indian Ocean (1908).* Rs. 13.	W. L. Dallas.
Monthly Weather Charts of the Bay of Bengal and adjacent sea north of the equator, showing mean pressure, winds and currents (1886).* Rs. 5.	H. F. Blanford.
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Daily Weather Reports and Charts of the Indian Monsoon Area for the Years 1893 to 1899, each month. Re. 1*.	Departmental.
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Vol. XXXI—

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Part II.	Rainfall of Hyderabad State (Pre-reorganisation) (in press).	K. N. Rao.

IX. KODAIKANAL OBSERVATORY BULLETINS.—

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Supplement to No. CXVIII.	Ditto.
Supplement to No. CXIX.	Ditto.

X. MEMOIRS OF THE KODAIKANAL OBSERVATORY.—

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Part I.	The Spectrum of Sunspots. Rs. 1-8.	J. Evershed.
Part II.	Results of prominence observations. Rs. 2.	J. Evershed and Mary A. Evershed.

XI. PUBLICATIONS CONTAINING MAINLY DATA—

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Magnetic, meteorological and seismological observations made at the Government Observatory, Bombay—

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1941.
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Colaba Magnetic Data. 1846—1905, Part I. Rs. 15. — N. A. F. Moos.
Colaba Magnetic Data. 1846—1905, Part II. Rs. 30. — Ditto.

India Weather Review—

Annual Summaries for the years 1891—1920 (30 Parts). Each Rs. 2.† — Departmental.

1921-22. Each Rs. 11-4.
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1945. Ditto.
1946. Ditto.
1947. Ditto.
1948. Ditto.
1949. Ditto.
1950. Ditto.
1951. Part A, B and C. Introduction in Press.
1952. Parts B and C. Part A (in Press.)
1953. Part B and C.
1954. Part B. Part C (in press).
1955. Part B, C.

Each Part priced separately. — Departmental.

Rainfall Tables—

(i) Daily Rainfall of India for the years 1891—1922 (32 volumes, Rs. 9 a volume).† — Departmental.
Daily Rainfall of India for the years 1923—24, each Rs. 10-12 or 17*s.* 6*d.* — Ditto.
Daily Rainfall of India for the years 1925—1950, each volume Rs. 68-8. — Ditto.
(ii) Monthly Rainfall of India, 1901—1922 (22 volumes). Rs. 2 a volume. — Ditto.
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(iii) Rainfall of the Bombay Presidency for the years previous to 1891. Vols. I—VI. Rs. 5-12 to Rs. 6-8. — N. A. F. Moos.

* Only volumes for 1891, 1892 and 1896 are available. The rest are out of print.
† Volumes for 1891, 1914, to 1924, 1932 to 1937 are out of print.
‡ Volumes for 1902—1906, 1910 and 1912—1917 are out of print.
†† Out of print.

PUBLICATIONS CONTAINING MAINLY DATA.—(contd.)

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(ii) Monthly Weather Report, each As. 8. up to 1947.	Ditto.
(iii) Monthly Weather Report, each Re. 1 from 1948.	Ditto
Weekly Weather Reports—	
Weekly Weather Report, published in Poona. Monthly subscription Re. 1.	Ditto.
Daily Weather Reports—	
India Daily Weather Report, published in Poona. Monthly subscription Rs. 3 without evening chart and Upper Air Report. (Rs. 5 complete.)	Ditto.
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Bombay, Calcutta, Madras, Nagpur, New Delhi — Monthly subscription Rs. 2 for each region.	
Upper Air Data—	
(i) Upper Air Data Parts 1—14 (1928 to 1935) each part priced Rs. 4-4 or 7*s.*	Departmental.
(ii) Upper Air Data Part A (1936—1943) each issue priced separately. 1944—1946 in Press.	Ditto.
(iii) Upper Air Data Part B (1936—1940) each issue priced separately.	Ditto.
(iv) Upper Air Data Part B (1941) (in Press.)	Ditto.
(v) Upper Air Data Part B (1942 to 1943) Printed.	Ditto
Seismological Bulletins—	
(i) Seismological Bulletins, Quarterly. (1938—1942)	
(ii) Seismological Bulletins, 1946, 1947 (roneoed) 1943 January—March, 1943 July—September, 1944 January—March — Quarterly.	Ditto.
(iii) Seismological Bulletins, 1948 January and February 1950, 1951 onwards — Monthly (roneoed).	Ditto.

XII. SEASONAL FORECASTS —

(i) Memorandum on the probable amount of rain and snow in Northwest India in January, February and March.
(ii) Memorandum regarding the probable amount of monsoon rainfall.
(iii) Memorandum on the rainfall of June and July and the probable amount during August and September.
(iv) Statement of the Rainfall and snowfall of Northwest India in January, February and March.
(v) Statement of actual rainfall in the monsoon season, June to September.

XIII. REPORT ON THE ADMINISTRATION OF THE METEOROLOGICAL DEPARTMENT OF THE GOVERNMENT OF INDIA (ANNUAL).—

(i) Annual Report of the Director General of Observatories on the observatories of Kodaikanal, Madras, Bombay and Alibag, accompanying their Annual Reports. As. 8.
(ii) Report on the administration of the Meteorological Department of the Government of India.
(iii) Report of the Kodaikanal Observatory 1922—1953.

XIV. INDIAN JOURNAL OF METEOROLOGY AND GEOPHYSICS (QUARTERLY)

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No. 1. January 1950. Rs. 2-6 or 4*s.*
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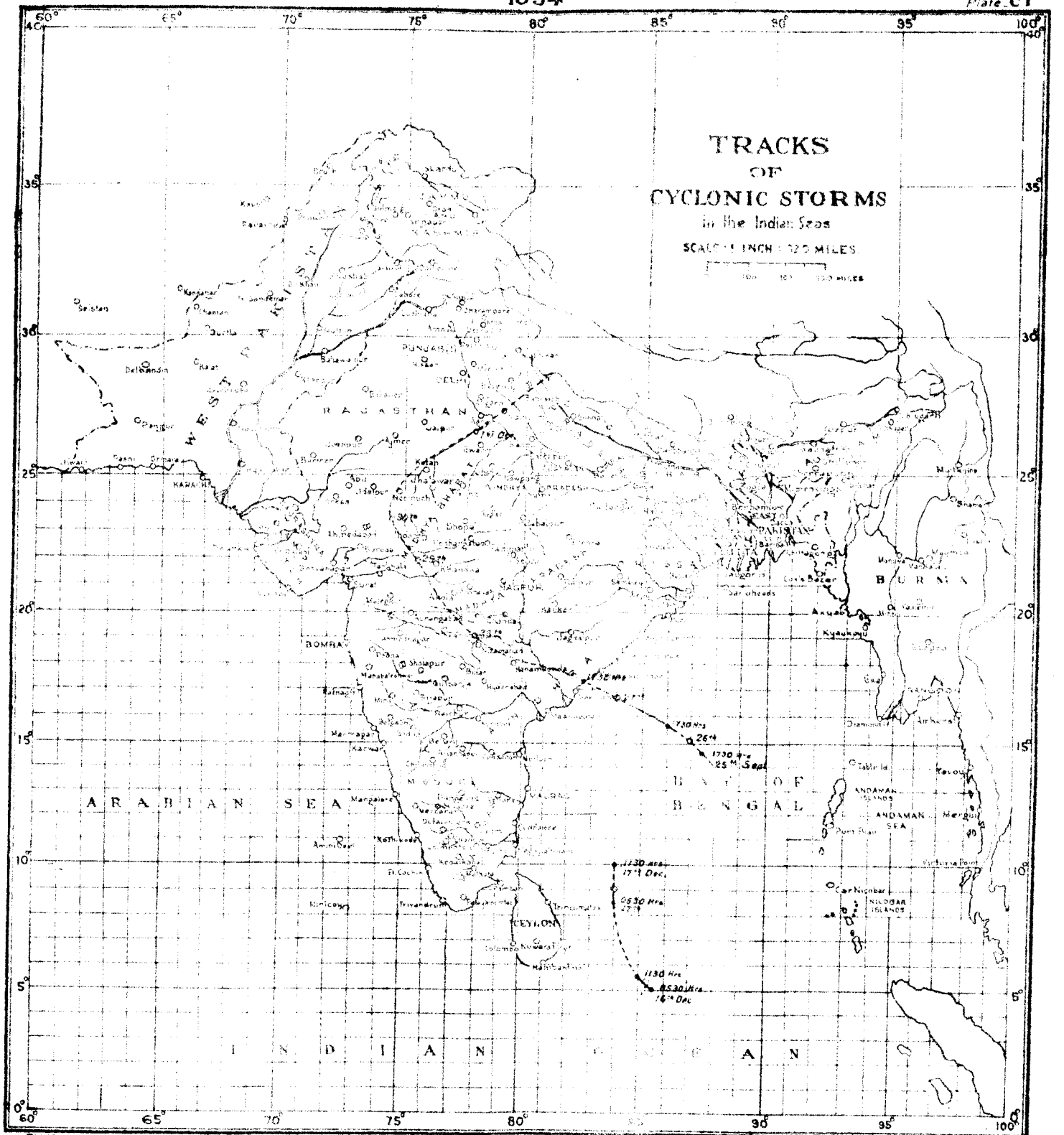

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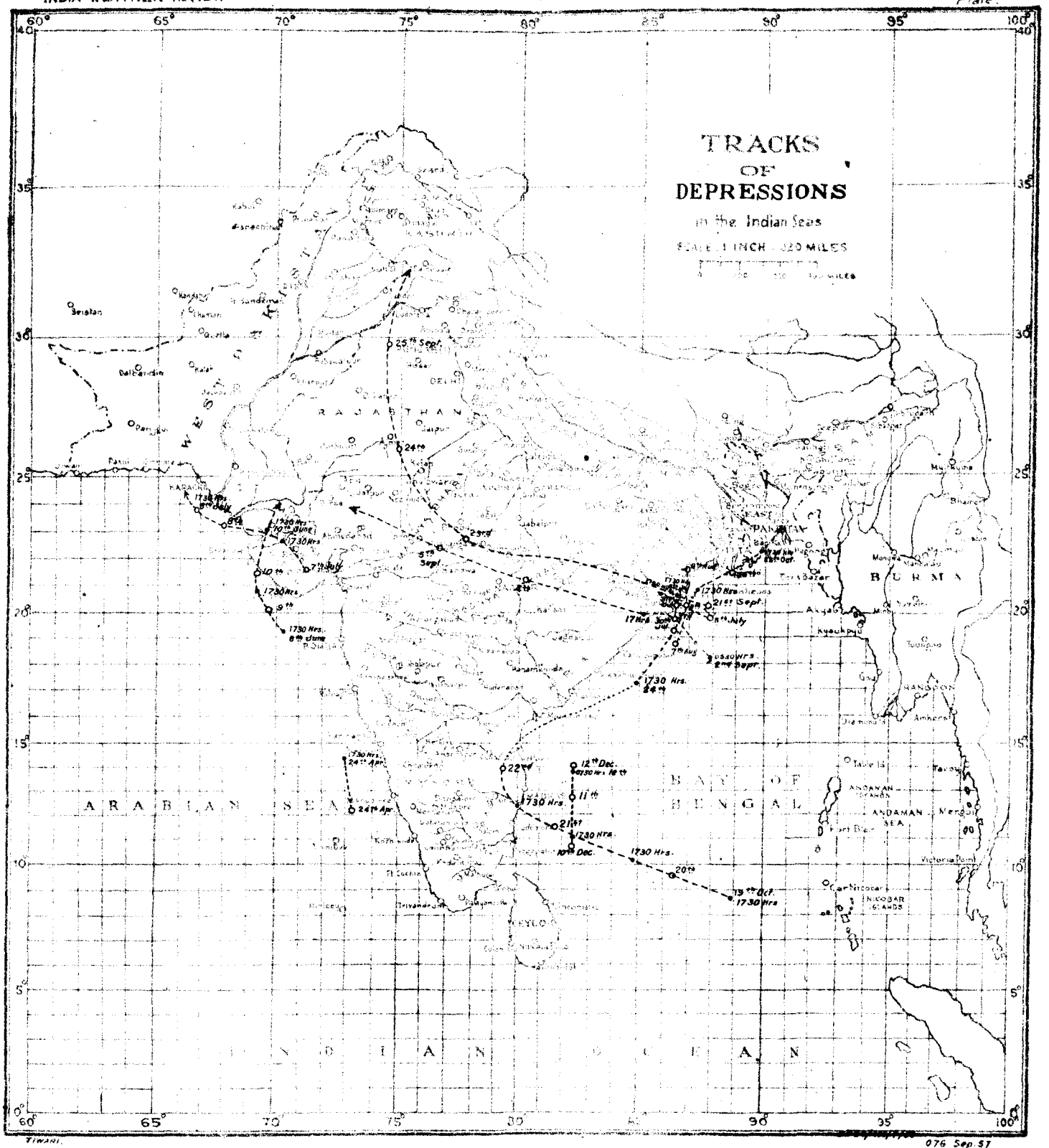
CIRCLE INDICATES POSITION OF CYCLONE OR DEPRESSION AT 0830 HRS.

- - - - - - - Depression. ——— Storm. ——— Severe Storm.



CIRCLE INDICATES POSITION OF DERESSION AT 0830 Hrs.